

January 2004 groundwater sampling report from
consultant to DHEC: Love Springs

Groundwater sampling had been done annually then apparently it was decreased to bi-annually.

This was the only report in Calhoun files however I assume that there would've been reports for each year from 1996 onward.

The report shows above detection levels of chlorinated solvents.

Consultant recommended fewer wells to sample based on no detection of contaminants.



**CONESTOGA-ROVERS
& ASSOCIATES**

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January 23, 2004

Reference No. 3144

Mr. Lucas Berresford
Site Engineering Section
Division of Site Assessment and Remediation
Bureau of Land and Waste Management
South Carolina Department of
Health and Environmental Control (SCDHEC)
2600 Bull Street
Columbia, South Carolina 29201-1708

RECEIVED

FEB 03 2004

DIVISION OF SITE
ASSESSMENT & REMEDIATION

Dear Mr. Berresford:

Re: Bi-annual Report No. 1
Voluntary Action Monitoring Program (VAMP)
Love Springs Site, Cherokee County, South Carolina (Site)

This letter presents the data for the first year of the bi-annual VAMP for the above-referenced Site. Conestoga-Rovers & Associates (CRA) has prepared this letter on behalf of National Starch and Chemical Company (National Starch).

In January 2002, CRA submitted to SCDHEC the Fourth Annual Report for the VAMP. The letter stated that it was CRA's opinion that National Starch had fulfilled the requirements under the VAMP agreement and CRA, on behalf of National Starch, requested that the monitoring program be discontinued for the Site. In a letter dated June 20, 2002, SCDHEC stated "SCDHEC does not believe that sampling should be discontinued due to the MCL exceedances." SCDHEC proposed to change the frequency of groundwater monitoring to bi-annually. In a July 2002 letter, CRA, on behalf of National Starch, agreed to the bi-annual sampling frequency.

The structure of this letter incorporates the outline provided in CRA's February 25, 1997 letter to SCDHEC, as follows:

- Introduction: the dates when monitoring occurred, the methods used for sampling and analysis, and the laboratory used for sample analysis;
- Groundwater Monitoring Results and Interpretation: a brief discussion and interpretation of the analytical results from this event, as well as the beginning of the monitoring program to the present;
- Surface Water Monitoring Results and Interpretation: a brief discussion and interpretation of the analytical results from this event, as well as the beginning of the monitoring program to the present;



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- Summary of Recommendations; and
- Attachments: analytical laboratory reports for the monitoring year.

1.0 INTRODUCTION

CRA conducted monitoring for the first year of the bi-annual VAMP on December 1, 2003.

1.1 Sampling Methods

The groundwater samples were collected using Passive Diffusion Bags (PDBs). On November 17, 2003, CRA placed the PDBs at the approximate midpoint of the saturated screen interval of each well. The PDBs were held in place by the permanent mounting hardware previously installed in each well in December 2000. CRA returned to the Site on December 1, 2003 to collect the groundwater samples.

Analytical Environmental Services, Inc. analyzed the samples for select Volatile Organic Compounds (VOCs) using SW-846 Method 8260B. One duplicate sample was collected from one well.

2.0 GROUNDWATER MONITORING

The groundwater samples were analyzed for cis-1,2-dichloroethene (cis-1,2-DCE), tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride in accordance with the VAMP.

2.1 Monitoring Results

The analytical results for each parameter are summarized in Table 1. Although Table 1 provides data from all VAMP events, the discussion within this section is devoted to discussing the results collected during the first year of the bi-annual VAMP. Section 2.2, below, includes a discussion of all data collected during the VAMP. The Analytical Laboratory Reports and CRA's data validation memo for the monitoring event are provided in Attachment A.

TCE and vinyl chloride were not detected in any of the groundwater samples collected in 2003. Cis-1,2-DCE was detected the groundwater sample collected from LS-3 at a concentration less than its federal Maximum Contaminant Level (MCL). PCE was detected in the duplicate groundwater samples collected from CRA-1-95 at concentrations greater than its MCL, which is consistent with prior data.



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2.2 Interpretation of Monitoring Results

TCE and vinyl chloride have not been detected in any samples collected since the beginning of the VAMP. Cis-1,2-DCE has periodically been detected in groundwater samples collected from LS-3 and CRA-2-95. The concentration of cis-1,2-DCE in the groundwater sample from LS-3 was 67 µg/L during the December 2003 sampling round. The concentration of cis-1,2-DCE in groundwater samples from CRA-2-95 has been decreasing since the first year of the VAMP and was non-detect during the December 2003 sampling round.

PCE has been detected in samples collected from CRA-1-95 during all years of the VAMP. The PCE concentration in CRA-1-95 has remained generally stable over time. The detected concentrations range from 6.4 to 44 µg/L for the entire VAMP monitoring history. The maximum of 44 µg/L was detected during the first year of the VAMP and the minimum of 6.4 µg/L was detected during the fourth year of the VAMP. The concentrations of PCE in the duplicate groundwater samples collected in December 2003 were 30 µg/L and 29 µg/L, respectively.

2.3 Groundwater Flow Directions

On November 17 and December 1, 2003, CRA measured the depths to groundwater in each well, prior to the placement of the PDBs. The depth measurements are presented in Table 2.

Figure 1 illustrates the direction of groundwater flow at the time of groundwater sample collection on December 1, 2003. The groundwater flow direction observed was generally southwest. This is consistent with historical flow patterns present at the Site.

3.0 SURFACE WATER MONITORING

Surface water monitoring was not conducted during the bi-annual VAMP event. In CRA's Semi-Annual Report, dated August 9, 2000, it was recommended that surface water monitoring for VOCs be discontinued. SCDHEC approved the discontinuation of surface water monitoring in a letter to CRA dated September 12, 2000.

4.0 SUMMARY OF RECOMMENDATIONS

CRA recommends that a further monitoring event be completed in December 2005 on selected monitoring wells. The bi-annual sampling will consist of collecting groundwater samples from



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five on-Site monitoring wells (LS-3, CRA-1-95, CRA-2-95, CRA-4-00, and CRA-5-00S). The groundwater samples will continue to be analyzed for cis-1,2-DCE, TCE, PCE, and vinyl chloride.

CRA recommends discontinuing groundwater sampling at monitoring wells LS-1, LS-2, CRA-3-95, and CRA-5-00D. The parameters of concern (cis-1,2-DCE, TCE, PCE, and vinyl chloride) have not been detected in the groundwater samples collected from monitoring wells LS-1, LS-2 and CRA-3-95 since sampling began in June 1997. The parameters of concern have also not been detected in the samples collected from monitoring well CRA-5-00D since the monitoring well was installed in June 2000. The parameters of concern have never been detected in the groundwater samples collected from CRA-4-00 and CRA-5-00S but these wells will continue to be sampled, as they are downgradient of CRA-1-95.

The next groundwater sampling round for the Site will be scheduled for December 2005. Subsequent to the sampling event, CRA, on behalf of National Starch, will submit a letter to SCDHEC summarizing the results.

Should you have any questions, please contact the undersigned or Lisa Hough at (519) 884-0510.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Fatima Juric

for Stephen M. Quigley

LH/ca/9
Encl.

c.c. Angela Dohl, National Starch
Lisa Hough, CRA
David Brytowski, CRA

TABLE 1

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GROUNDWATER SAMPLE ANALYTICAL RESULTS
LOVE SPRINGS SITE
CHEROKEE COUNTY, SOUTH CAROLINA

<i>cis</i> -1,2-dichloroethene (µg/L)									
MCL: 70 µg/L									
LS-1	LS-2	LS-3	CRA-1-95	CRA-2-95	CRA-3-95	CRA-4-00	CRA-5-00S	CRA-5-00D	
<u>Year One:</u>									
9-Apr-97	ND(5)	18/20	ND(5)	37 J	ND(5)	-	-	-	-
9-Jul-97	ND(5)	9.3	ND(5)/ND(5)	51	ND(5)	-	-	-	-
14-Oct-97	ND(5)	ND(5)	ND(5)/ND(5)	46	ND(5)	-	-	-	-
27-Jan-98	ND(5)	11	ND(5)/ND(5)	47	ND(5)	-	-	-	-
<u>Year Two:</u>									
15/16-Sep-98	ND(5)	ND(5)/ND(5)	ND(5)	18	ND(5)	-	-	-	-
3/4-Mar-99	ND(5)	ND(5)	ND(5)	21/21	ND(5)	-	-	-	-
<u>Year Three:</u>									
6-Jun-00	ND(5)	19	ND(5)/ND(5)	13	ND(5)	ND(5) ⁽¹⁾	ND(5) ⁽¹⁾	ND(5) ⁽¹⁾	ND(5) ⁽¹⁾
						ND(5) ⁽²⁾	ND(5) ⁽²⁾	ND(5) ⁽²⁾	ND(5) ⁽²⁾
						ND(5) ⁽³⁾	ND(5) ⁽³⁾	ND(5) ⁽³⁾	ND(5) ⁽³⁾
20-Dec-00	ND(5)	ND(5)/ND(5)	ND(5)	10	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
<u>Year Four:</u>									
26-Jun-01	ND(2)	ND(2)/6.7	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)
19-Dec-01	ND(2)	ND(2)	ND(2)/ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)
<u>Bi-annual</u>									
<u>Year One:</u>									
1-Dec-03	ND(5)	67	ND(5)/ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)

TABLE 1

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GROUNDWATER SAMPLE ANALYTICAL RESULTS
LOVE SPRINGS SITE
CHEROKEE COUNTY, SOUTH CAROLINA

trichloroethylene (µg/L)									
MCL: 5 µg/L									
	LS-1	LS-2	LS-3	CRA-1-95	CRA-2-95	CRA-3-95	CRA-4-00	CRA-5-00S	CRA-5-00D
<u>Year One:</u>									
9-Apr-97	ND(5)	ND(5)	ND(5)/ND(5)	ND(5)	5 UJ	ND(5)	-	-	-
9-Jul-97	ND(5)	ND(5)	ND(5)	ND(5)/ND(5)	ND(5)	ND(5)	-	-	-
14-Oct-97	ND(5)	ND(5)	ND(5)	ND(5)/ND(5)	ND(5)	ND(5)	-	-	-
27-Jan-98	ND(5)	ND(5)	ND(5)	ND(5)/ND(5)	ND(5)	ND(5)	-	-	-
<u>Year Two:</u>									
15/16-Sep-98	ND(5)	ND(5)	ND(5)/ND(5)	ND(5)	ND(5)	ND(5)	-	-	-
3/4-Mar-99	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	-	-	-
<u>Year Three:</u>									
6-Jun-00	ND(5)	ND(5)	ND(5)	ND(5)/ND(5)	ND(5)	ND(5)	ND(5) ⁽¹⁾	ND(5) ⁽¹⁾	ND(5) ⁽¹⁾
							ND(5) ⁽²⁾	ND(5) ⁽²⁾	ND(5) ⁽²⁾
							ND(5) ⁽³⁾	ND(5) ⁽³⁾	ND(5) ⁽³⁾
20-Dec-00	ND(5)	ND(5)	ND(5)/ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
<u>Year Four:</u>									
26-Jun-01	ND(2)	ND(2)	ND(2)/ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)
19-Dec-01	ND(2)	ND(2)	ND(2)	ND(2)/ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)
<u>Bi-annual</u>									
<u>Year One:</u>									
1-Dec-03	ND(5)	ND(5)	ND(5)	ND(5)/ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)

TABLE 1

GROUNDWATER SAMPLE ANALYTICAL RESULTS
LOVE SPRINGS SITE
CHEROKEE COUNTY, SOUTH CAROLINA

tetrachloroethene (µg/L)									
MCL: 5 µg/L									
LS-1	LS-2	LS-3	CRA-1-95	CRA-2-95	CRA-3-95	CRA-4-00	CRA-5-00S	CRA-5-00D	
Year One: 9-Apr-97 9-Jul-97 14-Oct-97 27-Jan-98	ND(5) ND(5) ND(5) ND(5)	ND(5)/ND(5) ND(5) ND(5) ND(5)	18 19 J / 30 J 40 / 44 38 / 38	5 UJ ND(5) ND(5) ND(5)	ND(5) ND(5) ND(5) ND(5)	-- -- -- --	-- -- -- --	-- -- -- --	-- -- -- --
Year Two: 15/16-Sep-98 3/4-Mar-99	ND(5) ND(5)	ND(5)/ND(5) ND(5)	42 37	ND(5) ND(5)	ND(5) ND(5)	-- --	-- --	-- --	-- --
Year Three: 6-Jun-00	ND(5)	ND(5)	33 / 36	ND(5)	ND(5)	ND(5) ⁽¹⁾ ND(5) ⁽²⁾ ND(5) ⁽³⁾	ND(5) ⁽¹⁾ ND(5) ⁽²⁾ ND(5) ⁽³⁾	ND(5) ⁽¹⁾ ND(5) ⁽²⁾ ND(5) ⁽³⁾	ND(5) ⁽¹⁾ ND(5) ⁽²⁾ ND(5) ⁽³⁾
20-Dec-00	ND(5)	ND(5)	32	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
Year Four: 26-Jun-01 19-Dec-01	ND(2) ND(2)	ND(2) ND(2)	6.4 26 / 26	ND(2) ND(2)	ND(2) ND(2)	ND(2) ND(2)	ND(2) ND(2)	ND(2) ND(2)	ND(2) ND(2)
Year One: 1-Dec-03	ND(5)	ND(5)	30 / 29	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)

GROUNDWATER SAMPLE ANALYTICAL RESULTS
LOVE SPRINGS SITE
CHEROKEE COUNTY, SOUTH CAROLINA

vinyl chloride (µg/L)									
MCL: 2 µg/L									
LS-1	LS-2	LS-3	CRA-1-95	CRA-2-95	CRA-3-95	CRA-4-00	CRA-5-00S	CRA-5-00D	
9-Apr-97 9-Jul-97 14-Oct-97 27-Jan-98	ND(2) ND(2) ND(2) ND(2)	ND(2)/ND(2) ND(2) ND(2) ND(2)	ND(2) ND(2)/ND(2) ND(2)/ND(2) ND(2)/ND(2)	2 UJ ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2) ND(2)	- - - -	- - - -	- - - -	- - - -
Year Two: 15/16-Sep-98 3/4-Mar-99	ND(2) ND(2) ND(2)	ND(2)/ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2)	- - -	- - -	- - -	- - -
Year Three: 6-Jun-00	ND(2)	ND(2)	ND(2)	ND(2)/ND(2)	ND(2)	ND(2) ⁽¹⁾ ND(2) ⁽²⁾ ND(2) ⁽³⁾	ND(2) ⁽¹⁾ ND(2) ⁽²⁾ ND(2) ⁽³⁾	ND(2) ⁽¹⁾ ND(2) ⁽²⁾ ND(2) ⁽³⁾	ND(2) ⁽¹⁾ ND(2) ⁽²⁾ ND(2) ⁽³⁾
20-Dec-00	ND(2)	ND(2)	ND(2)/ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)
Year Four: 26-Jun-01 19-Dec-01	ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2)	ND(2)/ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2)	ND(2) ND(2) ND(2)
31-annual Year One: 1-Dec-03	ND(2)	ND(2)	ND(2)/ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)	ND(2)

Notes:

Maximum Contaminant Level.

Micrograms per liter.

Indicates that the parameter was positively identified; the associated numerical value is the estimated concentration.

Indicates that the parameter was not detected; the associated numerical value is the estimated sample quantitation limit.

Indicates that the parameter was not detected at the detection limit shown in parentheses.

Indicates that the parameter exceeds its MCL.

Sample collected by conventional method (low flow sampling).

Sample collected by passive diffusion bag (upper interval).

Sample collected by passive diffusion bag (lower interval).

TABLE 2

GROUNDWATER ELEVATION MEASUREMENTS
LOVE SPRINGS SITE
CHEROKEE COUNTY, SOUTH CAROLINA

Well Location:											
Top of Well Riser Elevation: ⁽¹⁾		LS-1	LS-2	LS-3	CRA-1-95	CRA-2-95	CRA-3-95	CRA-4-00	CRA-5-00S	CRA-5-00D	
		831.41	820.13	816.43	832.59	826.90	817.93	839.46	842.38	842.27	
Date	Depth to Water (feet below top of riser)										
9-Apr-97	24.04	11.11	10.90	29.79	27.14	13.93	--	--	--	--	
9-Jul-97	24.55	13.62	13.07	29.92	27.87	15.99	--	--	--	--	
14-Oct-97	27.34	16.31	15.88	32.61	30.02	18.53	--	--	--	--	
27-Jan-98	27.45	11.03	11.16	33.13	29.15	13.72	--	--	--	--	
15-Sep-98	24.51	14.75	13.99	29.90	28.13	16.88	--	--	--	--	
3-Mar-99	28.63	14.09	12.24	32.66	29.07	15.19	--	--	--	--	
12-May-00	28.57	14.48	14.13	33.99	30.19	16.96	41.47	46.62	46.71	46.71	
5-Dec-00	31.97	20.51	19.54	37.22	33.57	22.20	44.55	49.28	49.50	49.50	
26-Jun-01	31.77	18.93	18.02	36.90	32.81	20.68	44.28	49.02	49.14	49.14	
19-Dec-01	33.68	21.54	20.59	38.35	34.58	23.10	46.05	50.52	50.71	50.71	
17-Nov-03	24.10	13.84	13.36	29.79	27.97	16.31	37.53	43.35	43.65	43.65	
1-Dec-03	24.54	13.97	13.57	30.26	28.25	16.42	37.91	43.68	43.95	43.95	

DateGroundwater Elevations (feet above mean sea level)

9-Apr-97	807.37	809.02	805.53	802.80	799.77	804.00	--	--	--	--	
9-Jul-97	806.86	806.51	803.36	802.67	799.04	801.94	--	--	--	--	
14-Oct-97	804.07	803.82	800.55	799.98	796.89	799.40	--	--	--	--	
27-Jan-98	803.96	809.10	805.27	799.46	797.76	804.21	--	--	--	--	
15-Sep-98	806.90	805.38	802.44	802.69	798.78	801.05	--	--	--	--	
3-Mar-99	802.78	806.04	804.19	799.93	797.84	802.74	--	--	--	--	
12-May-00	802.84	805.65	802.3	798.6	796.71	800.97	797.99	795.76	795.56	795.56	
5-Dec-00	799.44	799.62	796.89	795.37	793.33	795.73	794.91	793.10	792.77	792.77	
26-Jun-01	799.64	801.20	798.41	795.69	794.09	797.25	795.18	793.36	793.13	793.13	
19-Dec-01	797.73	798.59	795.84	794.24	792.32	794.83	793.41	791.86	791.56	791.56	
17-Nov-03	807.31	806.29	803.07	802.8	798.93	801.62	801.93	799.03	798.62	798.62	
1-Dec-03	806.87	806.16	802.86	802.33	798.65	801.51	801.55	798.7	798.32	798.32	

Note:

(1) All monitoring well casing elevations resurveyed in June 2000.